

902
537. R. Y.
4

H I N T S
O F
I M P O R T A N T U S E S,
T O B E D E R I V E D F R O M
A E R O S T A T I C G L O B E S.

W I T H
A P R I N T O F A N A E R O S T A T I C G L O B E,
A N D I T S A P P E N D A G E S.
O R I G I N A L L Y D E S I G N E D I N 1783.

B Y
T H O M A S M A R T Y N.

L O N D O N,
P R I N T E D F O R T H E A U T H O R;

And sold by Mr. WHITE, Fleet-Street; Mr. PAYNE, the Mews-Gate; Mr. ROBSON, New-Bond-Street;
Mr. JOHNSON, N^o 72, St. Paul's Church-yard; Mr. DEBRET, Piccadilly; and Mr. BECKET, Pall-Mall.

M D C C L X X X I V .



A D V E R T I S E M E N T.

THE design exhibited in the frontispiece is similar to one presented by me to his Royal Highness the Prince of Wales in November, 1783; and to another copy transmitted to the Academy of Sciences at Lyons, in February, 1784. The original was also communicated, about the same period, to many noble and eminent persons, all of whom were pleased to honour it with their approbation. The only additions are the rudder, and the retaining cords, of the umbrella: the latter were before omitted, to afford a better opportunity of shewing the umbrella hanging in a collapsed state to the rope mast. If the effects expected from a balloon so furnished should fail on trial, I have yet in reserve an improvement, from which I am sanguine enough to hope for compleat success.

While I was preparing the plate of my design, I was naturally led to turn my thoughts again to the subject of balloons: I then recollected, enlarged, and methodized some ideas, which I had mentioned some months since to many respectable persons, concerning the uses to which these machines might be applied. These I now take the liberty of submitting, together with the plate, to the judgement of the public.

I have been thinking of you very much lately, and wondering how you are getting on. I hope you are well and happy. I have been very busy lately, but I always find time to think of my friends. I hope to hear from you soon.

I have been thinking of you very much lately, and wondering how you are getting on. I hope you are well and happy. I have been very busy lately, but I always find time to think of my friends. I hope to hear from you soon.

I have been thinking of you very much lately, and wondering how you are getting on. I hope you are well and happy. I have been very busy lately, but I always find time to think of my friends. I hope to hear from you soon.

H I N T S,

OF IMPORTANT USES;

TO BE DERIVED FROM AEROSTATIC GLOBES.

ALL who have hitherto engaged in the new study of Aerostatics, seem to have made it the sole object of their researches, to discover some method of directing balloons, without regard to the current of air, and of navigating the atmosphere by the compass, at the pleasure of the voyager. For this purpose; many schemes of considerable ingenuity have been proposed. These have sought for the governing power required in wings and oars; whilst those have imagined, that the proposed end can be more commodiously and compleatly obtained, by means of sails and rudders. Among others, I also have dedicated some part of my leisure to the invention of an apparatus of the latter kind, from which I have the most sanguine hopes of success, whenever I have an opportunity of ascertaining its effects by an experiment.

In the mean time, however, we should not overlook the uses to which our present knowledge of Aerostatic machines may certainly and immediately be applied: if we cannot render them of that extensive benefit to society which we wish, we should next consider what practical good we may yet deduce from them, as they are.

It has long since occurred to me, that one obvious purpose to which balloons may be made subservient, is the instant communication of remote events, *by night signals*. Fires kindled on eminences were antiently employed as a general alarm on the appearance of an enemy; but by this expedient no more than a simple notice of one particular fact could be conveyed. Balloons, on the other hand, can ascend to an elevation far above the highest mountains; and raising with them *fireworks* of various colours, figures, and dimensions, might thus be made to describe, with sufficient accuracy, a variety of interesting particulars.

To reduce this idea into practice, it would be necessary to find at what distance the largest fireworks of the more brilliant kinds can be discerned by the naked eye in the usual state of the atmosphere, and at different degrees of altitude. At the mean distance, or for the greater security within this distance, stations might be appointed, and at each station be placed a watchman, provided with a book of signals, previously agreed, and a balloon to repeat. It might also serve to attract the attention of the centinels, if the first part of the fireworks in every case consisted of some general subject of the most powerful effect, as a prelude to the particular signal. Or the balloon bearing the particular signal might be preceded by a smaller balloon, of such inflammable materials as would blaze with the most violent combustion.

The signal balloon might be of the cheapest kind, from fifteen to twenty feet in diameter, and filled with rarefied air: such a globe, it is presumed, would be of sufficient power to rise perpendicularly with the necessary apparatus attached to it; otherwise, one more powerful must be substituted; as it is necessary, at all events, to insure to the machine an ascent nearly perpendicular.

To

To the globe should be fastened a cord to keep it *stationary*, at any given degree of altitude. It would be proper also, that to the length of eighty or an hundred yards from the balloon the cord should be of increased thickness, and compleatly covered with a very fine wire: and on this part of the cord, so protected, the firework should be fixed, at the distance of forty or fifty yards from the balloon; so as that the sparks may neither reach to injure the balloon above, or the naked cord below. The firework must be provided with one or more lighted fusées, calculated to take effect as soon as possible after the balloon shall have reached the point of its intended elevation. The machine, thus furnished, might be kept in perpetual readiness to be filled on the instant. It might be suspended on a moveable frame, or scaffold, that could be wheeled immediately from some proper shelter into the open air, on the first notice of a signal from the next station.

Till a series of experiments shall have determined the mean time in which the balloon at each station may be raised, and the mean distance at which each signal may be distinctly perceived, so as to be accurately repeated; it is impossible to calculate with precision how expeditiously any intelligence may be thus conveyed; I think, however, I have some grounds to compute, that it will travel on the average at least 40 miles an hour; an increase of dispatch, which, on emergencies, may be productive of the most salutary consequences.

Night signals of this kind would be of most essential utility to the inhabitants of a besieged town. When it might be wholly impracticable for any spy to deceive the vigilance of the enemy, so as to pass with intelligence; a balloon sent up by the besieged, might be made to communicate in a moment to the distance

distance of 20, or 30, perhaps 40, or 50 miles, the principal circumstances of their situation. Assurances of relief too, might be returned in the same manner, with equal celerity. These advantages would accrue to any besieged place; but they would be still much more important if we suppose that place to be a sea-port. The proper signal for the presence of an enemy being thus repeatedly thrown up in the night, might give timely information of their danger to any ships, that, missing all other information, would probably be endeavouring to make the harbour in unsuspecting security.

The operations of armies in the field might also be assisted in a great degree by this use of balloons. Detached parties for example, might thus in an instant of time receive orders to retreat; or to push forward without delay. In short, many of their principal movements might be immediately regulated from headquarters, according to any material information which may have been obtained by the General subsequent to their separation. In the same manner too, they might in their turn, acquaint the main body with the issue of the enterprize entrusted to their execution.

But the manœuvres of a fleet in the night seem yet more likely to be directed with superior advantage, by such signals as I have here proposed. Indeed, something of this kind is not unfrequently practised, I mean the throwing up of rockets, as was done by the French fleet at the beginning of the late war, in the night subsequent to the engagement with admiral Keppel. But how trifling is the altitude to which rockets ascend, compared with the possible elevation of a balloon; and how inferior is the splendor of their light to the vivid brilliancy of many other fireworks which might be employed in the mode above directed.

directed ! One can hardly reach the extremities of a very large fleet ; the other would convey information to any ships however widely dispersed the preceding day by an enemy, or by tempests. Add to this too, that the varieties of the rocket are not many, and cannot be so discriminated as to afford any number of signals sufficiently intelligible ; whereas the different colours, and confirmations, of different fireworks that might be attached to balloons ; the alterations of their positions, whether horizontal, or vertical ; the change of their combinations, and other artificial diversities of a similar kind ; might furnish a book of signals as numerous, and as clearly distinguishable by night, as those communicated with flags by day.

If these hints should appear to naval men in any degree worthy of adoption, it were to be wished, that some peculiar and powerful sort of firework should be previously settled by consent of all nations to denote imminent distress. This would be perceived by night at a much greater distance than the present signal of a gun fired to leeward ; and might thus be the means of saving the lives of many brave men, by guiding some friendly vessel, that might otherwise be ignorant of their situation, to give them seasonable assistance.

Nor is it in the night, and for the exhibition of signals only, that balloons, with retaining cords, might be advantageously employed by besieged towns, armies, fleets, and single ships. By day they might be of obvious use in every case where it is requisite to command an extensive and minute view.

Let us suppose, for instance, a balloon, with a proper apparatus, elevated from some central spot of a besieged place ; how fully and particularly might the

D

works,

works, force, and position of the enemy, be reconnoitred from the gallery of the machine! Not a single circumstance could escape the examination of an observer under whom every inequality on the surface of the earth would be stretched out to an extent beyond the reach of the best glasses.

Of course, they might be applied in the same manner, with a similar intention, by armies encamped in sight of each other. They might be sent up from out-posts, to discover the approach of an enemy, probably at the distance of a day's march; and previous to any movement in force, or by detachments, they might furnish the means of guarding against the designs of an ambuscade, by intelligence more certain, immediate, and complete, than can be obtained by scouts.

But here too, as before, the principal benefit to be reaped from this use of balloons would accrue to fleets and single ships. For the purpose of descrying land, or of receiving the earliest notice of an enemy, whom it may be an object to avoid or to pursue. It is now usual to station men at the mast-heads; but how much more effectually might these, and similar purposes, be answered, by the elevation of men in the gallery of a balloon, secured by cords to the lee-side of the vessel! The advantage resulting from such an expedient is of so much greater consequence in maritime affairs, as seamen have not the resources of armies and garrisons. To them no deserters come in; They can send no spies and scouts, to go and return; They have no method of procuring information but what is afforded them, by seeing to the greatest possible distance, with the aid of glasses, and the most exalted situation which they can command.

Aerostatic

Aerostatic machines, with *retaining cords*, may likewise be used to throw many new and important lights on the nature, power, and effects, of the atmosphere, in its different states; On clouds, and meteors, thunder and lightning, snow, hail, rain, and mists: To ascertain the just medium where animals may still retain life; but, advancing a little further, immediately lose it: and, to enquire how far this point of vitality may vary with the variations of the seasons, and the weather, in the lower regions. In short, the natural history of the air, in all its parts, may be thus compleatly explored and elucidated.

In the tempting serenity of a Summer's day, we know that many have already ventured, and probably very many more will venture on aerial expeditions, with a design of making observations at different altitudes. But who, for the sake of science, will voluntarily expose himself to be congealed into a hail-stone; or blasted by a thunder storm? After the dangers so narrowly escaped by the duke of Chartres, and his party, it is not to be expected that any philosophical adventurer will soon be hardy enough to despise the probable chance, much more the certainty, of similar hazard. Neither is it reasonable to suppose, that even one solitary experiment on the extinction of animal life in the upper regions, can be effectually made without such inconvenience at least to the person making it, as would totally deter him from any further prosecution of his remarks in this particular. It is possible, however, and it has in all ages been reckoned allowable, to obtain, at the expence of the inferior creatures, that knowledge which we ought not to hope at the risk of man. And this, in the present case, may be done, as I observed, by means of an aerostatic machine, with a retaining cord.

As it is of the utmost moment to the object of this experiment to know, with particular accuracy, the exact height to which the balloon is raised, more than ordinary care should be taken, so to proportion the lifting power to the weight which it is to carry, as that the whole shall rise in a line as nearly approaching as possible to a true perpendicular; and for the same reason it would be proper, that the retaining cord should have, every ten or twenty yards of additional length, distinctly marked upon it. Your machine thus provided, you must fasten to it a wicker cage, containing animals of different kinds and species, birds and beasts, some larger and some smaller; the number and size of these subjects being regulated by the force of the lifting power, as I have explained. Then suffer the whole to mount to any distance which you may chuse for your first experiment. As soon as you have ascertained this distance from the number of yards run off the reel, on which the cord is wound below, gently draw down the machine, and attentively remark, how the animals seem affected: after this, let them depart a second time, as much higher as you please, and a second time recall them, to examine their apparent state. And this you may repeat, regularly increasing the altitude by degrees, till you push the experiment to extremity, by sending your balloon into so high and pure an air, as may be fatal to one or more of the animals. Whenever you find this to be the case, you should expose another of the same species to the same trial, that you may be assured, whether the effect perceived be merely accidental, or whether it be produced by physical causes, fixed, and invariable in their operation.

But it is not enough once to go through this course of experiments: the same should be renewed with similar precaution under every aspect of the heavens, at every season of the year, and in every degree of heat and cold:

levity

levity and gravity, of the atmosphere. And it might be further useful to hang to the cage, or in place of the cage, to the balloon itself, various bodies of different properties, as tests, to discover the qualities predominant in the air, at the several distances from the earth. What an improvement might be made in the celebrated experiment of the electrical kite, by substituting a balloon that would rise so much higher, and carry with it an apparatus so much more complete?

The Experiments which I have now recommended, might be undertaken at no very great expence by a private individual; but these might be beyond measure enlarged and extended, under the direction of a public body, such as our Royal Society. Among other advantages which they might command, it is not to be doubted, but their August Patron, on application from them, would be graciously pleased to grant the lives of as many condemned criminals as they might desire, on condition that the men so spared should engage in services of supposed danger for the advancement of philosophy.

Then, and only then, at the hazard of men whose lives had been forfeited to the laws, we might hope to see every change of the atmosphere minutely examined. Specimens of the air at different heights, and in every different state, might be procured; whose general purity might be proved at leisure by Dr. Priestley's well-known gauge, and whose particular principles might be analyzed by various modes of chymical assays. The rising of vapours, and the fall of dews, might be explained; to what height they sensibly reach: the manner in which the clouds resolve themselves into rain might be determined; whether they distill it in drops, or pour it in torrents: The magazines of snow and hail might

be visited, and the mode of their formation seen: Even the more terrible meteors might be approached, and the electrical charge of a thunder-cloud might be measured on the spot, by a single turn of a machine properly furnished with an electrometer. At the same time too, the effects of all these dispositions of the atmosphere, as well as of different altitudes, on animal life, might be observed in a variety of instances with the utmost precision.

In the course of these enquiries, it should be one settled rule to employ balloons of all practicable materials, some filled with rarefied, and some with inflammable air. The intention of this hint is to decide, by actual experience, what kind of aerostatic globes is least subject to casualties, in all seasons and weathers: that every possible prospect of safety may be insured to those who may follow; if any shall afterward have the courage willingly to incur danger, in the pursuit of knowledge.

I cannot conclude this short essay without pointing out another use to which balloons, with retaining cords, may be applied: I mean, to the purposes of astronomy. Observatories are commonly built on hills and high towers, that they may be raised above the gross vapours near the surface of the earth, which frequently impede and confuse the vision. But how much purer would be the medium through which the heavenly bodies might be observed from the gallery of a balloon! In this case, the retaining cord would be an indispensable appendage, as it would insure a safe and easy descent to a convenient spot; the only thing required to render an aerial excursion by night, as pleasant as by day: And that the descent might be at the option of the observer, the reel on which the cord is to be wound, in order to bring down the machine, might be placed
in

in the gallery above, while the end of the cord might be fastened to some commodious fixture below.

If these speculations should ever be carried into execution, our catalogues of telescopic stars, it is probable, would be very considerably augmented. The number of moons revolving round the primary planets would be accurately determined; and the nature of Jupiter's belt, and Saturn's ring, it is possible, might receive much, and curious illustration. Even new planets connected with our system, might yet be found: Or the moons attendant on that lately discovered might, perhaps, fortunately be distinguished. Our own moon, however, it is to be presumed, would be the principal object of attention. The maps of her face would be corrected; the boundaries of her seas, lakes, woods, and mountains, accurately fixed; and Vesuvius's, and Hecla's, added to the new *Ætna* in her geography. In a word, astronomy might thus hope to derive from the balloons of Mr. Montgolfier, no less benefit, than she has already received from the admirable instruments of Mr. Herschel.

These few hints, which I have thus ventured to lay before the public, might be collaterally branched into many other suggestions of a similar kind, and no less interesting to society. Yet, I trust, that even these will alone be a sufficient answer to a question not unfrequently asked, *Of what use are balloons?* It will certainly give me the highest satisfaction, if the design which accompanies this publication shall be found to contribute any thing to the great requisite, the *art of directing balloons* at pleasure: but if I should be disappointed in this flattering expectation, I shall still be happy in the supposition, that this little pamphlet may afford some materials worthy to exercise the ingenuity of more able

able heads, in applying to practical purposes, that command of balloons which we already possess: And if even here too, I should be equally deceived, I shall under all console myself with the assurance, that I am entitled at least to the pardon, if not to the thanks of every candid man, for my endeavours, however unsuccessful, when they had for their object, *To expedite the communication of important events; To increase the means of safety both to fleets and armies; To furnish facts to meteorology; And to facilitate the discoveries of astronomy.*



F I N I S.